The electron-emitting device according to the present embodiment can drive in response to a voltage pulse of 100 picoseconds or less, and hence the displaying of an image in 1/30 second for one picture enables formation of 10,000 lines or more of scanning lines.

The voltage applied to the group of modulating electrodes (GR) is 0 V or less, or 30 V or more, under which the electron beams are OFF-controlled or ON-controlled, respectively. The amount of electron beams continuously varies at voltages between 0 V and 30 V. Thus, it is possible to effect gradational display according to the magnitude of the voltage applied to the modulating electrode.--

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Page 89, delete in its entirety.

Page 93, renumber as --page 94--.

Page 94, renumber as --page 93--.

IN THE CLAIMS:

Please cancel claims 1-66.

Please add claims 67-145 as follows:

--67. A display device comprising:

an electron-emitting device, comprising a laminate having an insulating layer disposed between opposing electrodes on a planar substrate, said insulating layer having an electron-emitting region spaced apart from said electrodes, wherein a first portion of said insulating layer

is disposed between said opposing electrodes, wherein a second portion of said insulating layer is disposed between one of said electrodes and said planar substrate, said emitting region being disposed in said first portion of said insulating layer and wherein electrons are emitted from said electron-emitting region by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

A4 cont

68. The display device of claim 67, wherein said electrodes, opposing each other at each end portion of the electrodes, hold said insulating layer without any overlap of said electrodes.

69. The display device of Claim 67, wherein said electron-emitting region comprises a layer of an electron-emitting material interposed in said insulating layer.

70. The display device of Claim 69, wherein said electron-emitting material is selected from the group consisting of borides, carbides, nitrides, metals, metal oxides, semiconductors, and carbon.

71. The display device of Claim 70, wherein said electron-emitting material comprises at least two kinds of different materials.

72. The display device of Claim 70, wherein said electron-emitting material is selected from the group consisting of Nb, Mo, Rh, Hf, Ta, W, Re, Ir, Pt, Ti, Au, Ag, Cu, Cr, Al, Co, Ni, Fe, Pb, Pd, Cs and Ba.

73. The display device of Claim 70, wherein said electron-emitting material comprises a metal oxide selected from the group consisting of In_2O_3, SnO_2, BaO, MgO and Sb_2O_3.

A4 Cont

74. The display device of Claim 70, wherein said electron-emitting material comprises fine particles of Pd or SnO_2.

75. The display device of Claim 67, wherein said electron-emitting region comprises a layer formed by incorporating an electron-emitting material in the insulating layer in a dispersed state.

76. The display device of Claim 75, wherein said electron-emitting material is selected from the group consisting of borides, carbides, nitrides, metals, metal oxides, semiconductors, and carbon.

77. The display device of Claim 76, wherein said electron-emitting material comprises at least two kinds of different materials.

78. The display device of Claim 76, wherein said electron-emitting material is selected from the group consisting of Nb, Mo, Rh, Hf, Ta, W, Re, Ir, Pt, Ti, Au, Ag, Cu, Cr, Al, Co, Ni, Fe, Pb, Pd, Cs and Ba.

79. The display device of Claim 76, wherein said electron-emitting material comprises a metal oxide selected from the group consisting of In_2O_3, SnO_2, BaO, MgO and Sb_2O_3.

A4 cont

80. The display device of Claim 76, wherein said electron-emitting material comprises fine particles of Pd or SnO_2.

81. The display device of Claim 67, wherein said electron-emitting region comprises an electron-emitting material.

82. The display device of Claim 81, wherein said electron-emitting material is selected from the group consisting of borides, carbides, nitrides, metals, metal oxides, semiconductors, and carbon.

83. The display device of Claim 82, wherein said electron-emitting material comprises at least two kinds of different materials.

84. The display device of Claim 82, wherein said electron-emitting material is selected from the group consisting of Nb, Mo, Rh, Hf, Ta, W, Re, Ir, Pt, Ti, Au, Ag, Cu, Cr, Al, Co, Ni, Fe, Pb, Pd, Cs and Ba.

A4 cont

85. The display device of Claim 82, wherein said electron-emitting material comprises a metal oxide selected from the group consisting of In_2O_3, SnO_2, BaO, MgO and Sb_2O_3.

86. The display device of Claim 82, wherein said electron-emitting material comprises fine particles of Pd or SnO_2.

87. The display device of Claim 67, wherein the one or both of a pair of said electrodes are in a multiple layer constitution.

88. The display device of Claim 87, wherein at least one layer of the multiple layers is made of a material not readily damaged by ion sputtering.

89. The display device of Claim 88, wherein said material comprises a high-melting material selected from the group consisting of W, LaB_6, carbon, TiC and TaC.

90. The display device of Claim 87, wherein at least one layer of said multiple layers comprises a material exhibiting a low work function.

A4 Cont

91. The display device of Claim 90, wherein said material is selected from the group consisting of SnO_2, In_2O_3, BaO, LaB_6, Cs, and CsO.

92. The display device of Claim 87, wherein at least one layer of said multiple layers comprises a material having a high electrical conductivity.

93. The display device of Claim 92, wherein said material is selected from the group consisting of Ag, Al, Cu, Cr, Ni, Mo, Ta, W, and an alloy of any of these.

94. A display device comprising:

an electron-emitting device, comprising a laminate having an insulating layer and a layer of an electron-emitting material disposed between opposing electrodes on a planar substrate, wherein said electron-emitting material is spaced apart from said electrode, wherein a first portion of

said electron emitting material is disposed between said opposing electrodes wherein a second portion of said electron emitting material is disposed between one of said electrodes and said planar substrate, and wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

95. A display device comprising:

an electron-emitting device, comprising a laminate comprising an insulating layer having an electron-emitting material in a dispersed state and disposed between opposing electrodes on a planar substrate, wherein a first portion of said electron emitting material is disposed between said opposing electrodes wherein a second portion of said electron emitting material is disposed between one of said electrodes and said planar substrate, and wherein electrons are emitted by applying a voltage between said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

A4 Cont

96. A display device comprising:

an electron-emitting device, comprising opposing electrodes, an insulating layer having a layer of an

electron-emitting material between said electrode layer and being disposed on a planar substrate, wherein said an electron-emitting material is spaced apart from said electrodes, wherein a first portion of said electron emitting-material is disposed between said opposing electrodes, wherein a second portion of said electron-emitting material is disposed between one of said electrodes and said planar substrate, and wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

97. A display device comprising:

an electron-emitting device, comprising opposing electrodes, an insulating layer containing an electron-emitting material being disposed between said electrodes in a dispersed state on a planar substrate; wherein said an electron-emitting material is spaced apart from said electrodes, wherein a first portion of said electron emitting-material is disposed between said opposing electrodes, wherein a second portion of said electron-emitting material is disposed between one of said electrodes and said planar substrate, and wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

98. A display device comprising:

an electron-emitting device, comprising an insulating layer is disposed between opposing electrodes on a planar substrate, and having fine particles arranged within said insulating layer in a dispersed state; wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

A4 cont

99. The display device of Claim 98, having the structure in which said fine particles are completely included into said insulating layer.

100. The display device of Claim 98, having the structure that any of said fine particles is partly included into and partly exposed from said insulating layer.

101. The display device of Claim 98, wherein said fine particles is composed of a substance selected from the group consisting of borides, carbides, nitrides, metals, metal oxides, semiconductors, and carbon.

102. The display device of Claim 98, wherein said fine particles are dispersed between the electrodes by coating.

103. The display device of Claim 98, wherein said fine particles are dispersed between the electrodes by vacuum deposition.

A4

104. The display device of Claim 98, wherein said fine particles are dispersed by thermal decomposition of an organic metal compound.

cont

105. A display device comprising:

an electron-emitting device, comprising opposing electrodes formed on an insulating layer disposed on a planar substrate and disposed between said opposing electrodes, and fine particles being dispersed within said insulating layer between said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

106. The display device of Claim 105, wherein said insulating layer comprises a low-melting glass.

107. The display device of Claim 105, wherein said insulating layer has a film thickness of from several ten angstroms to several ten microns.

108. The display device of Claim 105, where a plurality of said electron-emitting devices are mounted on a single plane.

109. The display device of Claim 98, comprising a substrate comprising a porous glass in which a metal or a metal oxide is deposited.

110. The display device of Claim 98, comprising a colored glass containing metal colloid fine particles.

111. A display device comprising:

an electron-emitting device, comprising opposing electrodes having a predetermined spacing disposed on a planar substrate, with at least two kinds of fine particles of materials having different conductivities disposed between said predetermined spacing, wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

112. The display device of Claim 96, ~~wherein the~~ insulating layer contains ~~an~~ electron-emitting material in a ~~dispersed~~ state.

113. The display device of Claim 67, wherein said electrodes are overlapped with each other.

114. The display device of Claim 71, wherein said different materials comprise materials having different conductivities.

A4 cont

115. The display device of Claim 77, wherein said different materials comprise materials having different conductivities.

116. The display device of claim 83, wherein said different materials comprise materials having different conductivities.

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117. A display device comprising:

an electron-emitting device, comprising a semiconductor formed between opposing electrodes and wherein fine particles are dispersed within said semiconductor ~~layer~~ or on said semiconductor ~~layer~~; and

a phosphor, wherein said phosphor emits ~~light~~ by a stimulation of the electrons emitted from said electron-emitting device.

~~118.~~ The display device of Claim ~~117~~, having the structure in which said fine particles are completely included into said semiconductor ~~layer~~.

~~119.~~ The display device of Claim ~~117~~, having the structure that said fine particles are partly contained in said semiconductor ~~layer~~ and partly exposed therefrom.

~~120.~~ The display device of Claim ~~117~~, wherein said fine particles are made of a substance selected from the group consisting of borides, carbides, nitrides, metals, metal oxides, semiconductors, and carbon.

~~121.~~ The display device of Claim ~~117~~, wherein said fine particles are dispersed between said electrode by coating.

~~122.~~ The display device of Claim ~~117~~, wherein said fine particles are dispersed between said electrode by vacuum deposition.

123. The display device of Claim 117, wherein said fine particles are dispersed by thermal decomposition of an organic metal compound.

124. The display device of Claim 117, having the device structure in which the electrodes are formed on a substrate, the semiconductor layer is formed between said electrodes, and the fine particles are arranged inside the layer, or on the layer, of said semiconductor layer in a dispersed state.

125. The display device of Claim 67, where a plurality of said electron-emitting devices are mounted on a single plane.

126. The display device of Claim 94, where a plurality of said electron-emitting devices are mounted on a single plane.

127. The display device of Claim 95, where a plurality of said electron-emitting devices are mounted on a single plane.

128. The display device of Claim 96, where a plurality of said electron-emitting devices are mounted on a single plane.

129. The display device of Claim 97, where a plurality of said electron-emitting devices are mounted on a single plane.

130. The display device of Claim 98, where a plurality of said electron-emitting devices are mounted on a single plane.

131. The display device of Claim 111, where a plurality of said electron-emitting devices are mounted on a single plane.

132. The display device of Claim 117, where a plurality of said electron-emitting devices are mounted on a single plane.

133. A method of preparing an electron-emitting device, comprising the steps of:

(i) forming electrodes on a substrate;

(ii) coating a mixture of fine particles and an insulating material in a solvent between said electrodes; and

(iii) baking the coated substrate so as to form an insulating layer containing said fine particles.

134. A method of preparing an electron-emitting device, comprising the steps of:

(i) forming electrodes on a substrate;

(ii) dispersing fine particles between said electrodes; and

(iii) forming an insulating layer on said dispersed fine particles.

135. The method of Claim 134, wherein said insulating layer is a layer comprised of a substance selected from the group consisting of an oxide, a nitride, a carbide and an organic polymer.

A4 Cont

136. The method of Claim 135, wherein said insulating layer has a film thickness of from about 1000 angstroms to about 1000 microns.

137. A method of preparing an electron-emitting device, comprising the steps of:

(i) introducing fine particles into an insulating layer, said fine particles being enclosed in the insulating layer so as to partially expose said fine particles.

138. A method of preparing an electron-emitting device, comprising the steps of:

(i) coating an insulating layer containing fine particles on a substrate;

(ii) thereafter baking said coating; and

(iii) forming electrodes on said insulating layer.

139. A method of preparing an electron-emitting device, comprising the steps of:

(i) forming electrodes on a substrate;

(ii) coating a dispersion containing fine particles and an organic binder between said electrodes; and

(iii) thereafter baking said substrate.

140. The method of Claim 139, wherein said organic binder is selected from the group consisting of a butyryl resins, acryl resins, vinyl chloride-vinyl acetate copolymers, phenol resins, nylons, polyesters and urethanes.

141. A method of preparing an electron-emitting device, comprising the steps of:

(i) forming a semiconductor layer on a substrate;

(ii) forming electrodes on said semiconductor layer; and

(iii) dispersing fine particles between said electrodes.

142. The method of Claim 141, wherein said semiconductor layer comprises a layer comprising an amorphous silicon semiconductor, a crystallized silicon semiconductor, or a compound semiconductor.

143. The method of Claim 141, wherein said semiconductor layer has a film thickness of from 50 angstroms to 10 μm.

144. A method of preparing an electron-emitting device, comprising the steps of:

(i) introducing fine particles into a semiconductor layer, said fine particles being completely enclosed in the semiconductor layer;

(ii) etching said semiconductor layer so as to partially expose said fine particles.

145. A method for displaying images comprising the steps of:

(i) applying a first voltage to a surface of a fluorescent member;

(ii) applying a voltage pulse to wiring electrodes so as to cause emission of electrons from an electron emitting device;

(iii) applying a second voltage to modulating electrodes to control the emitted electrons, in either an ON

state or an OFF state in accordance with information signals representing a line of an image to be displayed wherein the emitted electrons in the ON state impinge the fluorescent member.

(iv) successively repeating the steps of (ii) through (iii) thereby forming a picture of an image.

146. A method for displaying images according to Claim 145, wherein the display device comprises:

an electron-emitting device, comprising a laminate having an insulating layer disposed between opposing electrodes on a planar substrate, said insulating layer having an electron-emitting region spaced apart from said electrodes, wherein a first portion of said insulating layer is disposed between said opposing electrodes, wherein a second portion of said insulating layer is disposed between one of said electrodes and said planar substrate, said emitting region being disposed in said first portion of said insulating layer and wherein electrons are emitted from said electron-emitting region by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

147. A method for displaying images according to Claim 145, wherein the display device comprises:

an electron-emitting device, comprising a laminate having an insulating layer and a layer of an electron-emitting material disposed between opposing electrodes on a planar substrate, wherein said electron-emitting material is spaced apart from said electrode, wherein a first portion of said electron emitting material is disposed between said opposing electrodes wherein a second portion of said electron emitting material is disposed between one of said electrodes and said planar substrate, and wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

148. A method for displaying images according to Claim 145, wherein the display device comprises:

an electron-emitting device, comprising a laminate comprising an insulating layer having an electron-emitting material in a dispersed state and disposed between opposing electrodes on a planar substrate, wherein a first portion of said electron emitting material is disposed between said opposing electrodes wherein a second portion of said electron emitting material is disposed between one of said electrodes

and said planar substrate, and wherein electrons are emitted by applying a voltage between said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

149. A method for displaying images according to Claim 145, wherein the display device comprises:

an electron-emitting device, comprising opposing electrodes, an insulating layer having a layer of an electron-emitting material between said opposing electrodes layer and being disposed on a planar substrate, wherein said an electron-emitting material is spaced apart from said electrodes, wherein a first portion of said electron emitting-material is disposed between said opposing electrodes, wherein a second portion of said electron-emitting material is disposed between one of said electrodes and said planar substrate, and wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

150. A method for displaying images according to Claim 145, wherein the display device comprises:

an electron-emitting device, comprising opposing electrodes, an insulating layer containing an electron-emitting material being disposed between said electrodes in a dispersed state on a planar substrate; wherein said an electron-emitting material is spaced apart from said electrodes, wherein a first portion of said electron emitting-material is disposed between said opposing electrodes, wherein a second portion of said electron-emitting material is disposed between one of said electrodes and said planar substrate, and wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

A4 Cont

151. A method for displaying images according to Claim 145, wherein the display device comprises:

an electron-emitting device, comprising an insulating layer is disposed between opposing electrodes on a planar substrate, and having fine particles arranged within said insulating layer in a dispersed state; wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

152. A method for displaying images according to Claim 145, wherein the display device comprises:

an electron-emitting device, comprising opposing electrodes formed on an insulating layer disposed on a planar substrate and disposed between said opposing electrodes, and fine particles being dispersed within said insulating layer between said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

153. A method for displaying images according to Claim 145, wherein the display device comprises:

an electron-emitting device, comprising opposing electrodes having a predetermined spacing disposed on a planar substrate, with at least two kinds of fine particles of materials having different conductivities disposed between said predetermined spacing, wherein electrons are emitted by applying a voltage to said electrodes; and

a phosphor, wherein said phosphor emits light by a stimulation of the electrons emitted from said electron-emitting device.

154. A method for displaying images according to Claim 145, wherein the display device comprises: